SALT

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Total U.S. salt production in 2004 increased by more than 6% in 2004 to 46.5 million metric tons (Mt) compared with that of 2003 (table 1). According to the U.S. Geological Survey (USGS) canvass for 2004, 29 companies operated 64 salt-producing plants in 15 States. Of these, 10 companies and 16 plants produced more than 1 Mt each and accounted for 91% and 67%, respectively, of total U.S. production and 91% and 40%, respectively, of total value. Several companies and plants produced more than one type of salt. In 2004, 9 companies (12 operations) produced solar-evaporated salt; 6 companies (17 operations), vacuum pan salt; 11 companies (15 operations), rock salt; and 14 companies (32 operations), salt brine.

The five leading States, in descending order of total salt sold or used, were Louisiana with 32%; Texas, 22%; New York, 14%; Kansas, 6%; and Utah, 5%. Other Eastern States (Alabama, Michigan, Ohio, Tennessee, and West Virginia) accounted for 18% of the domestic total salt sold or used. Other Western States (Arizona, California, Nevada, New Mexico, and Oklahoma) represented 3% (table 4).

Salt, also known as sodium chloride, comprises the elements sodium and chlorine. Sodium is a silver-colored metal that is so unstable that it reacts violently in the presence of water, and chlorine is a greenish-colored gas that is dangerous and may be lethal. Yet the combination of these two elements form sodium chloride that is a white-colored compound essential to life itself. Virtually every person in the world has some direct or indirect contact with salt daily. People routinely add salt to their food as a flavor enhancer or apply rock salt to walkways to remove ice in the winter. Salt is used as feedstock for chlorine and caustic soda manufacture. These two inorganic chemicals are used to make many consumer-related end-use products, such as polyvinyl chloride (PVC), a plastic made from chlorine, and paper-pulping chemicals manufactured from sodium hydroxide (caustic soda).

Production

U.S. production and sales data for salt are developed by the USGS from an annual voluntary canvass of U.S. salt-producing sites and company operations. Production refers to the quantity of salt mined or manufactured that is available for sale. Salt sold or used is the quantity of salt that was sold directly to customers or used captively by the salt producer, which usually is a chloralkali (chlorine and sodium hydroxide) manufacturer.

Of the 29 companies to which a canvass form was sent, all but 2 responded [Dow Chemical Co. for production data, and Morton Salt (a division of Rohm and Haas Co.) for end use and distribution by State data] representing 76% of the totals shown in this report. Data for the nonrespondents were estimated based on their prior responses to previous annual surveys, the 2004 production estimate survey, or brine production capabilities for chloralkali manufacture based upon published chlorine production capacities [1.75 metric tons (t) of salt required per ton of chlorine capacity].

The structure of the U.S. salt industry has changed throughout the years. In 1970, 50 companies operated 95 salt-producing plants in the United States. Market competition, increased energy and labor costs, less expensive imports, fluctuations in currency exchange rates, and an excess of production capacity (resulting in the downsizing of the industry through mergers and acquisitions) reduced the number of operations in the industry to 29 companies and 64 plants by 2004.

The four types of salt that are surveyed are classified according to the method of recovery as follows: rock salt, from the surface or underground mining of halite deposits; solar salt, from the solar evaporation of seawater, landlocked bodies of saline water, or primary or byproduct brines; vacuum pan salt, from the mechanical evaporation of a purified brine feedstock; and brine, from the solution mining of underground halite deposits. Data for brine production and consumption represent the anhydrous salt content only and not the weight of the water.

***Mining.*—Rock Salt.**—Rock salt is mined by the room-and-pillar method, which is similar to that used in coal and trona mining. The pillar widths are controlled by the percentage of extraction permissible at the various depths and room widths. Most room-and-pillar operations recover about 45% to 65% of the resource, with the remainder left behind as pillar supports for structural integrity of the mine. The salt is drilled, cut, blasted, mucked, crushed, and transported to the surface for processing, which usually involves removing the impurities and screening the material to finer size fractions.

Underground mining practices of bedded halite (commonly referred to as “rock salt”) and domal salt formations are similar except for the height differences within the mines of the two types of operations. For example, bedded formations usually are laterally extensive but are vertically restricted. Salt domes are laterally restrictive but are vertically extensive. Many salt domes have depths in excess of 6,100 meters (m) (20,000 feet), yet many outcrop at the surface. Most Gulf Coast salt mining operations are generally less than 300 m (1,000 feet) below the surface. Working at greater depths is difficult because of higher temperatures and denser rock.

Solar Evaporation.—Solar evaporation uses the wind and the sun to evaporate the water and is an effective method of producing solar salt in areas of high evaporation and low precipitation. Along coastal margins in many parts of the world, seawater is collected and allowed to evaporate in specially constructed concentrating and evaporating ponds. Seawater contains various dissolved salts that will separate depending on their relative solubilities. Calcium carbonate, which is the least soluble, will separate out first. Highly soluble magnesium salts tend to separate last. The order of separation of mineral salts from seawater from first to last are calcite,

gypsum, halite, astrakainite, epsomite, kainite, hexahydrite, kieserite, carnallite, and bishofite. Saline lakewater is also processed using solar evaporation. The ponds are separated by levees that isolate the brine during different stages of fractional crystallization.

The brine is circulated among a network of interconnecting ponds, with salinity increasing with each transfer. The brine is then treated with lime to remove excess calcium sulfate, pumped to evaporation ponds, and then transferred to harvesting ponds to permit the salt to crystallize. After about 85% of the salt is precipitated, the remaining supernatant liquid, called "bitterns," can be pumped to adjacent ponds for subsequent extraction of bromine, magnesium, potassium, and sodium compounds. The harvesting pond is flooded again with new brine from the lime pond to repeat the cycle. It takes about 5 years once seawater is first introduced into the system for the completion of the crystallization process. The salt is harvested by special tractors equipped with scrapers and is ready for processing.

Solution Mining.—The first reported use of solution mining was about 250 B.C. in China when holes were drilled into deep salt deposits. The brine was brought to the surface by pipes made of bamboo. The brine was evaporated over fires fueled with coal, wood, or unprocessed natural gas. The basis of current technology began in France around A.D. 858. Today, an injection well is sunk, and pressurized freshwater is introduced to hydraulically fracture the bedded salt. Once communication with the production well is established, the brine is pumped to the surface for treatment. Solution mining can also use annulus injection, which uses a pair of concentric pipes (one carries the solvent downward and the other containing the brine upward), or tubing injection, which introduces the solvent at the bottom of the tube.

Solution mining is used to obtain a sodium chloride feedstock for vacuum pan salt production and for chlorine, caustic soda, and synthetic soda ash (excluding the United States) manufacture. The quantity of underground salt dissolved and recovered as brine to make vacuum pan salt usually is not reported as primary salt production, only the quantity of vacuum pan salt manufactured is reported. The quantity of brine used to make chloralkali chemicals is reported as either the amount of captive brine used or brine sold. The chemical industry is the leading consumer of salt brine in the world.

***Processing.*—Rock Salt.**—About 80% of total rock salt produced and imported is used for highway deicing. Crushing and screening to the proper physical size is usually the only processing that road salt undergoes. In many operations, these steps are done underground in the mine to minimize haulage and storage costs. In addition, the extremely fine fraction, which often is unusable and would represent a waste product if brought to the surface, remains underground.

Solar Salt.—After harvesting, the salt crystals are washed with dilute brine to remove residual bitterns and impurities. The salt is transferred to processing facilities where it is washed with saline water, dried for about 8 minutes at approximately 160° C (300° F), and screened into fine to coarse sizes, depending on the end use of the salt to be sold. Most operations ship solar salt in bags and in bulk, using barges, truck, and rail transportation.

Mechanical Evaporation.—Vacuum pan salt is not mined but is a type of salt produced using mechanical evaporation technology. Although rock salt, solar salt, and salt brine may be used to make vacuum pan salt, virtually all domestic vacuum pan salt is obtained from solution mining underground salt formations. Vacuum pan salt is obtained by dehydrating brine using heat alone or in combination with a vacuum. The vacuum pan process conserves energy by utilizing multiple-effect evaporators connected to vacuum pumps. A saturated salt solution will boil at a higher temperature than pure water. When a vacuum is applied, the brine boils at a lower temperature, enabling the superheated vapor that is generated to act as the heating medium for the next evaporator.

The grainer or open pan process uses open, rectangular pans with steam-heated immersion coils to evaporate the water in the brine. Rotating rakes scrape the salt precipitate into a sump or up a ramp, depending on the method, and onto conveyors for debrining and drying treatment. The final product is usually flake shaped rather than the typical cubic form. Flake salt is preferred for production of cheese, butter, and baked goods.

The Alberger process is a modified grainer operation that produces cubic salt with some flake salt. The pans are shallow, circular units with external heating units, rather than heating coils. The open pan process cannot be operated successfully in regions with high humidities because the evaporation rate is too slow and more energy is required to evaporate the brine.

Consumption

Depending on the location, winter 2004 was either mild or severe as evidenced by many nationwide newspaper articles regarding road salt use. Some parts of the nation experienced freezing rain and sleet that required road deicing and others were blanketed with numerous snowfalls that also necessitated using large quantities of road salt (Saladin and Hansel, 2004§[1]; Jones, 2005§).

In 2004, apparent consumption (salt sold or used plus imports minus exports) was 55.8 Mt, whereas reported consumption (sales or use as reported by the salt companies, including their imports and exports) was 51.5 Mt. Although these two measures of consumption are not necessarily expected to be identical, they normally are similar. Apparent consumption normally is greater than reported consumption because apparent consumption includes additional quantities of salt imported and exported by non-salt-producing companies, such as some chloralkali operations and salt distributors. Reported consumption statistics are those reported only by the domestic salt producing companies.

The direct and indirect uses of salt number about 14,000 according to industry sources. The USGS annually surveys 8 major categories comprising 29 end uses. The 2004 reported percentage distribution of salt by major end use was chemicals, 39%; ice control, 37%; distributors (grocery and other wholesalers and retailers, etc.), 8%; general industrial, 7%; agricultural, 3%; food processing, 3%; primary water treatment, 2%; and other uses combined with exports, 1% (table 5). Distributors represented a substantial share of salt sales by the salt industry; all this salt is ultimately resold to many different end users. For a more complete

[1]References that include a section mark (§) are found in the Internet References Cited section.

analysis of end-use markets, specific sectors of distribution in table 5 can be combined, such as agricultural and water treatment with agricultural and water conditioning distribution, respectively.

Aside from the different types of salt, there are various distinctions in the packaging and applications of salt. Salt for human consumption is packaged in different sized containers for several specialized purposes. Table salt may contain 0.01% potassium iodide as an additive, which provides a source of iodine that is essential to the oxidation processes in the body. Kosher salt, sea salt, condiment salt, and salt tablets are special varieties of salt.

Animal feed and water conditioning salt are made into 22.7-kilogram (50-pound) pressed blocks. Iodine, sulfur, trace elements, and vitamins are occasionally added to salt blocks to provide nutrients not found naturally in the diet of certain livestock. Salt is also compressed into pellets that are used for water conditioning.

Chemical Industry.—The leading consumer of salt, primarily salt brine, is the chemical industry. Salt brine is obtained from extraction of natural underground saline sources, solution-mined halite deposits (salt beds or salt domes), or the dissolution of solar salt supplies. Within this industry, the chloralkali sector remains the major consumer of salt for manufacturing chlorine, coproduct sodium hydroxide, and synthetic soda ash. Since 1986, when the last synthetic soda ash plant closed because of high production costs and competition with less expensive natural soda ash, no synthetic soda ash has been manufactured in the United States; many countries, however, still produce synthetic soda ash and use vast quantities of salt brine as feedstock.

Salt is used as the primary raw material in chlorine manufacture because it is an inexpensive and widely available source of chlorine ions. For sodium hydroxide production, salt is the main source of sodium ions. About 98% of the domestic chlorine and sodium hydroxide produced is obtained from the electrolysis of salt brine feedstock by using three-cell technologies. The types of cells and the percentages of chlorine manufactured by them are diaphragm, 78%; mercury, 14%; and membrane, 6%. The remaining 2% of chlorine and caustic soda production is recovered as a byproduct from magnesium and sodium metal manufacture. It takes about 1.75 t of salt to make 1.0 t of chlorine and 1.1 t of coproduct caustic soda. The electrolytic process ionizes the sodium chloride compound and selectively allows the ions to migrate through special membranes. Chlorine gas forms at the anode, while sodium ions bond with water molecules at the cathode to form sodium hydroxide with hydrogen gas evolving.

Chlorine and caustic soda are considered to be the first generation of products made from salt. These two chemicals are further used to manufacture other materials, which are considered to be the second generation of products from salt. Although most salt brine is produced by the same companies that use it, many chloralkali manufacturers now purchase brine from independent brine supply companies. In certain cases, brine is produced by a chemical company that uses some of it and sells the excess to neighboring competitors. According to a survey of domestic salt-based chlorine facilities, about 48% of the salt used to manufacture chlorine was captive (produced by manufacturing companies), and 31% was purchased brine. Purchased solar salt and rock salt comprised 12%, and imported rock, solar, and vacuum pan salt was 9% (tables 5, 6).

In 2004, according to the U.S. Census Bureau, 12.2 Mt of chlorine and 9.5 Mt of sodium hydroxide (caustic soda or lye) were produced. Based on the industry average ratio of 1.75 t of salt required to produce 1.0 t of chlorine and 1.1 t of coproduct sodium hydroxide, the chlorine and caustic soda industry consumed about 21.4 Mt of salt for feedstock. Reported consumption of total domestic and imported salt for chlorine manufacture was 19.2 Mt (table 5). The difference between the calculated and reported quantities was the amount of salt not reported to the USGS from imports or captive brine production of chloralkali producers.

Salt is also used as a feedstock in chemical plants that make sodium chlorate (by the electrolysis of an acidified salt brine using hydrochloric acid adjusted to a pH of 6.5), metallic sodium (by the electrolysis of a molten salt mixture containing 33.2% sodium chloride and 66.8% calcium chloride, which is added to reduce the melting temperature of salt), and other downstream chemical operations. In powdered soaps and detergents, salt is used as a bulking agent and a coagulant for colloidal dispersion after saponification. In pharmaceuticals, salt is a chemical reagent and is used as the electrolyte in saline solutions. It is used also with sulfuric acid to produce sodium sulfate and hydrochloric acid. This subsector is relatively small, representing only 5% of domestic salt sales for the entire chemical sector and only 2% of total domestic salt consumption.

The consumption of salt for metallic sodium has declined during the past several years. Since the 1970s, the number of producers has decreased to one from three; Ethyl Corp. and RMI Titanium Corp. exited the market in 1985 and 1992, respectively, leaving E.I. du Pont de Nemours & Co., Inc. as the sole manufacturer of metallic sodium in the United States. In 1998, the domestic market was less than 30,000 t, having decreased from about 126,000 t in 1978. The phasing out of tetraethyl lead and tetramethyl lead gasoline additives was the main reason for the decline in consumption. In 1978, sodium usage in gasoline represented about 80% of the domestic market. Although there is no information about sodium consumption in 2004, the leading use of sodium in 1998 was for sodium borohydride production, which is the feedstock for sodium dithionite that is used as a reductive bleaching agent by the pulp and paper industry. Sodium for sodium borohydride manufacture accounted for about 38% of metallic sodium consumption. Sodium metal also is used to manufacture sodium azide, which is used in automotive air bags. Other promising uses of sodium metal are in the remediation of chemical weapons, chlorofluorocarbons, pesticides, and polychlorinated biphenyls.

Ice Control and Road Stabilization.—The second ranked end use of salt is for highway deicing. The developer of the Fahrenheit temperature scale discovered that salt mixed with ice at a temperature below the freezing point of water creates a solution (brine) with a lower freezing point than water alone. The brine forms below the surface of the ice and snow and prevents the water from freezing into ice and bonding with the road surface, thus causing the snow and ice to melt. Salt is an inexpensive, widely available, and effective ice control agent. It does, however, become less effective as the temperature decreases below about -6.5° C to -9.5° C (15° F to 20° F). At lower temperatures, more salt would have to be applied to maintain higher brine concentrations to provide the same degree of melting. Most winter snowstorms and ice storms happen when temperatures are between -4° C and 0° C (25° F and 32° F), the range in which salt is most effective. An anticaking agent, such as ferric ferrocyanide (Prussian Blue) or sodium ferrocyanide (Yellow Prussiate of Soda), is used to prevent the salt from agglomerating. Both additives are nontoxic and harmless to humans. In

fact, sodium ferrocyanide is approved for use in food-grade salt by the U.S. Food and Drug Administration (U.S. Department of Health and Human Services, U.S. Food and Drug Administration, Food and Nutrition Board, 1966).

In highway deicing, salt has been associated with corrosion of bridge decks, motor vehicles, reinforcement bar and wire, and unprotected steel structures used in road construction. Surface runoff, vehicle spraying, and windblown actions also affect soil, roadside vegetation, and local surface- and ground-water supplies. Although evidence of environmental loading of salt has been found during peak usage, the spring rains and thaws usually dilute the concentrations of sodium in the area where salt was applied.

Salt also is added to stabilize the soil and to provide firmness to the foundation on which highways are built. The salt acts to minimize the effects of shifting caused in the subsurface by changes in humidity and traffic load.

The quantity of salt consumed for road deicing each year is directly related to the severity of the winter weather conditions. Long-range forecasting of salt consumption in this application is extremely difficult because of the complexities in long-range forecasting of the weather. Meteorologists, however, are becoming more aware of the dynamics of certain weather phenomena that influence the climate in various parts of the world. One of these phenomena is El Niño, an increase in sea-surface temperatures in the equatorial Pacific Ocean, is now believed to be the single leading weather influence on Earth.

Distributors.—A tremendous amount of salt is marketed through various distributors, some of which specialize in such markets as agricultural and water treatment services, two sectors where the salt companies also have direct sales (table 5). Distributor sales also include grocery wholesalers and/or retailers, institutional wholesalers, U.S. Government resale, and other wholesalers and retailers.

General Industrial.—The industrial uses of salt are diverse. They include, in descending order of quantity consumed, oil and gas exploration, other industrial applications, textiles and dyeing, metal processing, pulp and paper, tanning and leather treatment, and rubber manufacture.

In oil and gas exploration, salt is an important component of drilling fluids in well drilling. It is used to flocculate and increase the density of the drilling fluid to overcome high down-well gas pressures. Whenever a drill hits a salt formation, salt is added to the drilling fluid to saturate the solution and to minimize the dissolution within the salt stratum. Salt is also used to increase the set rate of concrete in cemented casings.

In textiles and dyeing, salt is used as a brine rinse to separate organic contaminants, to promote "salting out" of dyestuff precipitates, and to blend with concentrated dyes to standardize them. One of its main roles is to provide the positive ion charge to promote the absorption of negatively charged ions of dyes.

In metal processing, salt is used in concentrating uranium ore into uranium oxide (yellow cake). It also is used in processing aluminum, beryllium, copper, steel, and vanadium.

In the pulp and paper industry, salt is used to bleach wood pulp. It also is used to make sodium chlorate, which is added along with sulfuric acid and water to manufacture chlorine dioxide, an excellent oxygen-based bleaching chemical. The chlorine dioxide process, which originated in Germany after World War I, is becoming more popular because of environmental pressures to reduce or eliminate chlorinated bleaching compounds.

In tanning and leather treatment, salt is added to animal hides to inhibit microbial activity on the underside of the hides and to replace some of the moisture in the hides. In rubber manufacture, salt is used to make buna, neoprene, and white types. Salt brine and sulfuric acid are used to coagulate an emulsified latex made from chlorinated butadiene.

Agricultural Industry.—Since prehistoric times, humankind has noticed that animals satisfied their salt hunger by locating salt springs, salt licks, or playa lake salt crusts. Barnyard and grazing livestock need supplementary salt rations to maintain proper nutrition. Veterinarians advocate adding loose salt in commercially mixed feeds or in block forms sold to farmers and ranchers because salt acts as an excellent carrier for trace elements not found in the vegetation consumed by grazing livestock; selenium, sulfur, and other essential elements are commonly added to salt licks, or salt blocks, for free-choice feeding.

Food Processing.—Every person uses some quantity of salt in their food. The salt is added to the food by the food processor or by the consumer as a flavor enhancer, preservative, binder, fermentation-control additive, texture-control agent, and color developer. This major category is subdivided, in descending order of salt consumption, into other food processing, meat packers, canning, baking, dairy, and grain mill products.

In meat packing, salt is added to processed meats to promote color development in bacon, ham, and other processed meat products. As a preservative, salt inhibits the growth of bacteria, which would lead to spoilage of the product. Early pioneers stored their perishable food in salt barrels for protection and preservation. Salt acts as a binder in sausages to form a binding gel made up of meat, fat, and moisture. Salt also acts as a flavor enhancer and a tenderizer.

In the dairy industry, salt is added to cheese as a color-, fermentation-, and texture-control agent. The dairy subsector includes companies that manufacture creamery butter, condensed and evaporated milk, frozen desserts, ice cream, natural and processed cheese, and specialty dairy products.

In canning, salt is primarily added as a flavor enhancer and preservative. It also is used as a carrier for other ingredients, dehydrating agent, enzyme inhibitor, and tenderizer.

In baking, salt is added to control the rate of fermentation in bread dough. It also is used to strengthen the gluten (the elastic protein-water complex in certain doughs) and as a flavor enhancer, such as a topping on baked goods.

The food-processing category also contains grain mill products, which consist of milling flour and rice and manufacturing cereal breakfast food and blended or prepared flour.

In the "other food processing" category, salt is used mainly as a seasoning agent. Other food processing includes miscellaneous establishments that make food for human consumption (such as potato chips and pretzels) and for domestic pet consumption (such as cat and dog food).

Water Treatment.—Many areas of the United States have hard water, which contains excessive calcium and magnesium ions that contribute to the buildup of a scale or film of alkaline mineral deposits in household and industrial equipment. Commercial and

residential water-softening units use salt to remove the ions that cause the hardness. The sodium ions captured on a resin bed are exchanged for the calcium and magnesium ions. Periodically, the water-softening units must be recharged because the sodium ions become depleted. Salt is added and dissolved, and the brine replenishes the lost sodium ions.

Stocks

Because bulk salt is stored at many different locations, such as plants, ports, terminals, and warehouses, data on the quantity of salt stockpiled by the salt industry are not reliable enough to formulate accurate inventory totals; however, yearend stocks of producers were estimated to be 2 Mt, and consumer inventories also were estimated to be high. Most of these inventories were imported rock salt and solar salt. Many salt distributors, municipalities, road deicing contractors, salt producers, and States stockpiled additional quantities of salt in anticipation of adverse weather conditions. Deicing salt inventories were extremely large by yearend 2004 in anticipation of severe winter weather during late 2004 to early 2005. For the reasons discussed above, salt stocks are assumed to be the difference between salt production and salt sold or used in calculating apparent consumption.

Transportation

Because the locations of the salt supplies are not often near consumers, transportation can become an important cost. Pumping salt brine through pipelines is an economic means of transportation but cannot be used for dry salt. Large bulk shipments of dry salt in ocean freighters or river barges are low in cost but are restricted in points of origin and consumption. River and lake movement of salt in winter is often severely curtailed because of frozen waterways. As salt is packaged, handled, and shipped in smaller units, the costs increase and are reflected in higher selling prices.

Transportation costs significantly add to the price of salt. In some cases, shipping costs are higher than the actual value of the salt. Ocean vessels can transport greater quantities of salt than barge, rail, or truck shipments. Transoceanic imports of salt have been increasing in some areas of the United States because they are more cost competitive than salt purchased from domestic suppliers using barge, rail, or truck transportation. One important factor that often determines the quantity of imported salt that can be delivered is the depth of the channels and the ports; many ports are not deep enough to accommodate the larger ships.

Prices

The four types of salt that are produced have unique production, processing, and packaging factors that determine the selling prices. Generally, salt sold in bulk is less expensive than salt that has been packaged, pelletized, or pressed into blocks. Salt in brine is the least expensive salt sold because mining and processing costs are less. Vacuum pan salt is the most expensive because of the higher energy costs involved in processing and the purity of the product.

Price quotations are not synonymous with average values reported to the USGS. The quotations do not necessarily represent prices at which transactions actually took place or bid and asked prices. Yearend prices for salt are no longer quoted in Chemical Market Reporter; this information was last available for 1997. The average annual values, as collected by the USGS and listed in table 7, represent a national average value for each of the types of salt and the various product forms.

Foreign Trade

Under Harmonized Tariff Schedule of the United States (HTS) nomenclature, imports are aggregated under one category named "Salt (including table and denatured salt) and pure sodium chloride, whether or not in aqueous solution, seawater." The same classification also applies to exports. The HTS code for salt is 2501.00.0000. The trade tables in this report list the previous and current identification codes for salt. Although several other HTS codes pertain to various salt classifications, the United States aggregates shipments under one code because the sums of individual subclassifications fail to meet the minimum dollar requirements necessary for individual listings.

Based on U.S. Census Bureau data for 2004, the United States exported 1.11 Mt; this was a 55% increase compared with that of 2003 (table 8). In 2004, the majority of exports (87%) were to Canada. Salt was shipped to 73 countries through 31 customs districts; the Cleveland, OH, district exported the most and represented 38% of the U.S. total (table 9). Based on U.S. Census Bureau statistics, the United States imported 11.9 Mt of salt from 47 countries in 2004, which was 7% less than was imported during 2003 (table 10). Canada was the leading source of imports, representing about 36% of total imports. Table 11 lists the imports of salt by customs districts. Of the 38 customs districts that imported salt in 2004, the New York, NY, customs district was the largest in terms of tonnage accounting for about 23% of the total. The quantity of imported salt was about 11 times more than that of exports. This indicates the magnitude of the United States' reliance on salt imports. The majority of imported salt was brought into the country by foreign subsidiaries of major U.S. salt producers. Generally, imported salt can be purchased and delivered to many customers at prices lower than the comparable domestic product because production costs are lower abroad, currency exchange rates are more favorable, and ocean freight rates are less expensive than overland rail or truck rates.

World Review

Table 12 lists world salt production statistics for 115 nations based on reported and estimated information. In 2004, the total estimated world production increased to about 208 Mt. The United States remained the world's leading salt-producing country, representing 22% of total world output.

Most countries possess some form of salt production capability with production levels set to meet their own domestic demand requirements and with additional quantities available for export. Many developing nations tend to develop their agricultural resources to feed their population first. Utilization of easily extractable mineral resources follows, and salt is one of the first commodities to be mined. Some countries, such as the United States, import a substantial amount of salt to meet total demand requirements because of economic factors as previously discussed.

European Salt Company (ESCO) was formed in 2001 as a joint venture between the K+S Aktiengesellschaft of Germany (62%) and Solvay S.A. of Belgium (38%). With combined production of more than 5 million metric tons per year (Mt/yr), ESCO was the leading European salt producer. In June, Solvay announced it would sell its share of the partnership to K+S but would retain the salt brine operations for its captive use at its synthetic soda ash and chloralkali facilities (Industrial Minerals, 2004).

China.—China is the world's leading producer of synthetic soda ash which uses large quantities of salt as feedstock. Although China's chloralkali industry is concentrated in the eastern Provinces where most of the population and salt resources are located, many of the salt operations have not been able to keep up with the strong demand created by the rise in soda ash production. The salt deposits in the central and western Provinces cannot be utilized because of overland transportation difficulties, so China has had to rely on salt imports from Australia and India to satisfy its supply requirements (Asian Chemical News, 2004). These two nations may not be able to supply China for long if Chinese salt demand continues to grow. It is expected that there will be a salt shortage in China for the near future (Asian Chemical News, 2005).

Sri Lanka.—Aside from the tremendous toll on human lives, the large tsunami that devastated many areas of Southeast Asia on December 26 inundated thousands of rice farms, fruit plantations, and wells with salt water. Salt crusts formed on the fields as the seawater evaporated, and saline water infiltrated the soils and contaminated many underground fresh-water aquifers. Agricultural officials in Sri Lanka estimated that it would take a decade for the lands to be restored for farming again. Many coastal villages have become dependent on outside assistance for food and water. Similar salt contamination problems affected other Indian Ocean islands, such as the Maldives, and Indonesia (Pearce, 2005§).

Vietnam.—Vietnam produced more than 800,000 t in 2004 and reduced its dependency on imported salt. The Government offered incentives to salt producers to use technological improvements to expand salt production in 2005. About 30,000 t of salt was exported to Burma, Cambodia, Japan, the Republic of Korea, and Laos in 2004 (Xinhua News Agency, 2004§).

Outlook

The U.S. salt industry continued in a positive direction of increased production, consumption, and world trade of salt. Despite that some chlorine plants closed and others were idled during the previous couple of years, remaining chlorine facilities ran at higher capacity utilization rates thereby offsetting any change in salt brine production and consumption. Because the chloralkali industry is an intense energy consumer, any increase in energy prices will have an adverse effect on chlorine manufacture and a corresponding effect on salt brine usage. Solar salt and vacuum pan salt production and consumption have been consistent and the outlook is favorable that this trend should continue. Rock salt production and consumption is heavily dependent on the severity of winter weather. Although the severity of the weather is virtually impossible to forecast far in advance, the supplies of salt, from either domestic or imported sources, are more than adequate to meet any anticipated increase in demand.

Because salt is a relatively low-value commodity, the shipping cost for oceanic, rail, or truck transportation can be an important determining factor when attempting to secure supply sources from either domestic or foreign locations. If energy prices increase, one mode of transportation may favor one over the others. Excluding deicing salt, domestic salt consumption may fluctuate but should continue to grow parallel to population growth trends. U.S. total salt production in 2005 is estimated to be 46 Mt.

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GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

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TABLE 1
SALIENT SALT STATISTICS[1]

(Thousand metric tons and thousand dollars)

	2000	2001	2002	2003	2004
United States:					
Production:[2]					
Brine	22,500	20,400	19,300	20,000	20,500
Rock	15,000	17,000	13,500	16,300	18,300
Solar	3,810	3,310	3,390	3,330	3,520
Vacuum and open pans	4,200	4,120	4,100	4,070	4,100
Total	45,600	44,800	40,300	43,700	46,500
Sold or used by producers:					
Quantity	43,300	42,200	37,700	41,100	45,000
Value	1,040,000	1,110,000	1,010,000	1,130,000	1,270,000
Exports:					
Quantity	642	1,120	689	718	1,110
Value	37,800	48,000	31,600	37,500	47,600
Imports for consumption:					
Quantity	8,960	12,900	8,160	12,900	11,900
Value	127,000	179,000	129,000	196,000	159,000
Consumption:					
Apparent[3]	51,600	54,000	45,100	53,200	55,800
Reported	54,000	48,700	43,600	50,200	51,500
World, production	195,000 [r]	199,000 [r]	195,000 [r]	199,000 [r]	208,000 [e]

[e]Estimated. [r]Revised.

[1]Data are rounded to no more than three significant digits.

[2]Excludes Puerto Rico.

[3]Sold or used plus imports minus exports.

TABLE 2
SALT PRODUCED IN THE UNITED STATES, BY TYPE AND PRODUCT FORM[1]

(Thousand metric tons)

Product form	Vacuum and open pans	Solar	Rock	Brine	Total
2003:					
Bulk	737	1,990	15,800	20,000	38,500
Compressed pellets	1,290	389	XX	XX	1,680
Packaged	1,870	810	414	XX	3,100
Pressed blocks	171	136	78	XX	384
Total	4,070	3,330	16,300	20,000	43,700
2004:					
Bulk	728	2,170	17,800	20,500	41,200
Compressed pellets	1,310	391	XX	XX	1,710
Packaged	1,900	811	459	XX	3,170
Pressed blocks	167	147	81	XX	394
Total	4,100	3,520	18,300	20,500	46,500

XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

SALT SOLD OR USED IN THE UNITED STATES, BY TYPE AND PRODUCT FORM[1, 2]

(Thousand metric tons and thousand dollars)

	Vacuum and open pans		Solar		Rock		Brine		Total	
Product form	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
2003:										
Bulk	736	44,400	1,440	35,100	13,600	291,000	20,000	144,000	35,800	515,000
Compressed pellets	1,310	177,000	372	44,100	XX	XX	XX	XX	1,680	222,000
Packaged:										
Less-than-5-pound units	221	NA	13	NA	(3)	NA	XX	XX	234	XX
More-than-5-pound units	1,570	NA	967	NA	455	NA	XX	XX	2,990	XX
Total	1,790	255,000	981	70,100	455	33,200	XX	XX	3,230	358,000
Pressed blocks:										
For livestock	107	NA	98	NA	86	NA	XX	XX	291	XX
For water treatment	65	NA	23	NA	6	NA	XX	XX	93	XX
Total	172	18,100	121	12,100	92	9,310	XX	XX	385	39,500
Grand total	4,010	495,000	2,910	161,000	14,100	334,000	20,000	144,000	41,100	1,130,000
2004:										
Bulk	718	44,800	1,600	37,200	16,900	408,000	20,500	144,000	39,700	634,000
Compressed pellets	1,330	184,000	364	41,800	XX	XX	XX	XX	1,700	226,000
Packaged:										
Less-than-5-pound units	218	NA	8	NA	(3)	NA	XX	XX	227	XX
More-than-5-pound units	1,610	NA	945	NA	455	NA	XX	XX	3,010	XX
Total	1,830	269,000	953	64,400	456	39,000	XX	XX	3,240	372,000
Pressed blocks:										
For livestock	102	NA	107	NA	75	NA	XX	XX	284	XX
For water treatment	63	NA	25	NA	5	NA	XX	XX	93	XX
Total	165	17,400	131	12,300	81	8,340	XX	XX	377	38,000
Grand total	4,040	515,000	3,040	156,000	17,400	456,000	20,500	144,000	45,000	1,270,000

NA Not available. XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]As reported at salt production locations, the term "sold or used" indicates that some salt, usually salt brine, is not sold but is used for captive purposes by plant or company. Because data do not include salt imported, purchased, and/or sold from inventory from regional distribution centers, salt sold or used by type may differ from totals shown in tables 5 and 6, which are derived from company totals.

[3]Less than ½ unit.

TABLE 4
SALT SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars)

State	2003		2004	
	Quantity	Value	Quantity	Value
Kansas	2,770	123,000	2,890	127,000
Louisiana	12,600	152,000	14,300	186,000
New York	5,230	225,000	6,430	301,000
Texas	9,640	116,000	9,780	118,000
Utah	2,200	119,000	2,250	107,000
Other Eastern States[3]	7,510	336,000	8,090	360,000
Other Western States[4]	1,140	63,800	1,250	71,200
Total	41,100	1,130,000	45,000	1,270,000
Puerto Rico[e]	45	1,500	45	1,500

[e]Estimated.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]The term "sold or used" indicates that some salt, usually salt brine, is not sold but is used for captive purposes by plant or company.

[3]Includes Alabama, Michigan, Ohio, Tennessee, and West Virginia.

[4]Includes Arizona, California, Nevada, New Mexico, and Oklahoma.

TABLE 5

DISTRIBUTION OF DOMESTIC AND IMPORTED SALT BY PRODUCERS IN THE UNITED STATES BY END USE AND TYPE[1, 2]

(Thousand metric tons)

End use	Standard industrial classification	Vacuum and open pans		Solar		Rock		Brine		Total[3]	
		2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
Chemical:											
Chloralkali producers	2812	21	18	326	315	637	725	17,800	18,200	18,800	19,200
Other chemical	28 (excludes 2812, 2899)	231	243	217	196	808	651	2	2	1,260	1,090
Total		253	261	542	511	1,440	1,380	17,800	18,200	20,100	20,300
Food-processing industry:											
Meat packers	201	247	246	46	51	80	90	--	--	374	387
Dairy	202	122	122	10	9	4	3	1	--	136	135
Canning	2091, 203	154	150	39	38	37	37	--	1	231	225
Baking	205	193	193	5	5	12	12	--	--	210	210
Grain mill products	204 (excludes 2047)	91	92	10	7	17	14	--	--	117	113
Other food processing	206-208, 2047, 2099	545	557	74	78	99	96	1	1	719	733
Total		1,350	1,360	184	188	249	251	2	2	1,790	1,800
General industrial:											
Textiles and dyeing	22	104	104	38	34	9	12	(4)	(4)	151	150
Metal processing	33, 34, 35, 37	14	13	24	21	88	75	(4)	(4)	126	108
Rubber	2822, 30 (excludes 3079)	3	3	1	1	1	2	62	64	67	69
Oil	13, 29	24	31	147	189	44	50	2,000	2,070	2,210	2,340
Pulp and paper	26	10	10	44	45	17	15	18	18	88	89
Tanning and/or leather	311	11	8	20	17	39	35	--	--	71	61
Other industrial	XX	115	130	108	94	110	490	(4)	1	333	714
Total		282	300	379	400	310	679	2,080	2,160	3,050	3,540
Agricultural:											
Feed retailers and/or dealers mixers	5159	313	318	346	366	430	407	--	--	1,090	1,090
Feed manufactuers	2048	45	45	124	127	290	283	--	--	460	455
Direct-buying end user	02	5	4	13	15	46	42	--	--	65	62
Total		364	367	483	508	767	732	--	--	1,610	1,610
Water treatment:											
Government (Federal, State, local)	2899	17	16	103	100	127	133	3	2	251	252
Commercial or other	2899	149	162	197	248	178	192	2	2	526	604
Total		166	178	301	349	305	325	6	5	777	856
Ice control and/or stabilization:											
Government (Federal, State, local)	9621	1	1	958	920	15,200	15,500	--	--	16,200	16,400
Commercial or other	XX	5	5	271	236	2,040	2,280	--	--	2,320	2,520
Total		6	6	1,230	1,160	17,200	17,800	--	--	18,500	18,900
Distributors:											
Agricultural distribution	5191	66	64	99	112	50	57	--	--	215	234
Grocery wholesalers and/or retailers	514, 54	529	526	213	215	61	68	--	--	802	808
Institutional wholesalers and end users	58, 70	103	107	56	53	51	49	(4)	(4)	210	209
Water-conditioning distribution	7399	122	118	387	369	26	26	1	1	537	514
U.S. Government resale	9199	(4)	(4)	(4)	(4)	1	1	--	--	1	1
Other wholesalers and/or retailers	5251	866	895	872	890	424	377	(4)	9	2,160	2,170
Total		1,690	1,710	1,630	1,640	614	577	1	10	3,930	3,940
Other[5]		100	95	48	32	277	471	21	125	446	723
Grand total		4,210	4,280	4,790	4,780	21,200	22,200	20,000	20,300	50,200	51,500

See footnotes at end of table.

TABLE 5—Continued

DISTRIBUTION OF DOMESTIC AND IMPORTED SALT BY PRODUCERS IN THE UNITED STATES BY END USE AND TYPE[1, 2]

XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]The quality of imports included in the total for each type of salt is the amount reported by the U.S. salt industry, not the quantity reported by the U.S. Census Bureau that appears in tables 1, 11, and 12.

[3]Because data include salt imported, produced, and/or sold from inventory from regional distribution centers, data for salt sold or used by type may differ from totals shown in tables 1, 3, and 4, which are derived from plant reports at salt production locations. Data may differ from totals shown in table 6 because of changes in inventory and/or incomplete data reporting.

[4]Less than ½ unit.

[5]Includes exports.

TABLE 6

DISTRIBUTION OF DOMESTIC AND IMPORTED EVAPORATED AND ROCK SALT IN THE UNITED STATES, BY DESTINATION[1, 2]

(Thousand metric tons)

	2003				2004			
	Evaporated				Evaporated			
Destination	Vacuum and open pans	Solar	Rock	Total	Vacuum and open pans	Solar	Rock	Total
Alabama	67	2	80	150	69	3	75	147
Alaska	5	3	(3)	8	3	5	(3)	8
Arizona	13	97	2	112	11	98	3	112
Arkansas	45	2	57	105	49	2	50	102
California	211	649	3	863	219	679	3	901
Colorado	12	76	130	218	12	83	169	264
Connecticut	16	82	119	216	16	82	182	279
Delaware	4	10	1	16	4	12	2	19
District of Columbia	1	34	(3)	35	1	27	(3)	28
Florida	83	246	6	335	88	234	6	329
Georgia	79	51	51	181	85	54	52	191
Hawaii	(3)	1	--	2	(3)	1	--	1
Idaho	18	97	(3)	115	19	103	2	124
Illinois	347	123	1,810	2,280	348	123	1,670	2,140
Indiana	260	127	1,050	1,440	262	133	1,020	1,410
Iowa	136	92	518	747	136	96	489	721
Kansas	91	44	273	409	87	62	721	870
Kentucky	64	6	790	859	62	5	807	874
Louisiana	57	2	517	575	62	2	631	695
Maine	14	4	231	249	15	4	222	241
Maryland	62	147	19	228	64	83	21	168
Massachusetts	30	269	210	509	33	271	270	574
Michigan	280	44	2,510	2,840	280	43	2,610	2,930
Minnesota	141	160	609	910	161	182	575	918
Mississippi	28	1	246	274	28	1	301	329
Missouri	146	63	614	823	142	64	588	794
Montana	1	24	1	26	1	26	1	28
Nebraska	62	44	177	282	61	45	178	283
Nevada	5	288	(3)	293	5	278	(3)	283
New Hampshire	15	91	57	163	15	91	95	201
New Jersey	116	208	138	461	117	202	78	397
New Mexico	16	55	1	72	17	70	2	89
New York	188	42	2,410	2,640	191	38	2,900	3,120
North Carolina	112	68	80	260	115	79	134	329
North Dakota	4	14	5	23	4	15	4	23
Ohio	412	100	3,190	3,710	409	94	2,810	3,320
Oklahoma	36	22	50	108	36	23	43	102
Oregon	17	102	1	120	17	101	1	119
Pennsylvania	183	112	1,930	2,230	185	102	2,060	2,340
Rhode Island	4	238	105	347	4	238	105	347
South Carolina	36	6	5	47	37	6	8	51
South Dakota	20	43	47	109	19	44	33	96
Tennessee	101	18	542	661	116	9	552	677
Texas	223	144	180	548	225	160	179	564
Utah	13	272	160	445	15	285	136	436
Vermont	7	5	391	403	7	5	363	375
Virginia	70	187	109	366	66	130	70	266
Washington	27	89	3	119	29	108	8	145
West Virginia	12	5	264	281	12	5	186	203
Wisconsin	208	130	1,240	1,580	214	137	1,320	1,670

See footnotes at end of table.

TABLE 6—Continued

DISTRIBUTION OF DOMESTIC AND IMPORTED EVAPORATED AND ROCK SALT IN THE UNITED STATES, BY DESTINATION[1, 2]

(Thousand metric tons)

	2003				2004			
	Evaporated				Evaporated			
Destination	Vacuum and open pans	Solar	Rock	Total	Vacuum and open pans	Solar	Rock	Total
Wyoming	(3)	20	2	23	(3)	21	2	23
Other[4]	107	32	268	408	101	22	438	562
Total[5]	4,210	4,790	21,200	30,200	4,280	4,780	22,200	31,200

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Each salt type includes domestic and imported quantities. Brine is excluded because brine is not shipped out of State.

[3]Less than ½ unit.

[4]Includes shipments to overseas areas administered by the United States, Puerto Rico, exports, and some shipments to unspecified destinations.

[5]Because data include salt imported, purchased, and/or sold from inventory from regional distribution centers, data for evaporated and rock salt distributed by State may differ from totals shown in tables 1 and 3, which are derived from plant reports at salt production locations. Data may differ from totals shown in table 5 because of changes in inventory and/or incomplete data reporting.

TABLE 7
AVERAGE VALUE OF SALT, BY PRODUCT FORM AND TYPE[1]

(Dollars per metric ton)

Product form	Vacuum and open pans	Solar	Rock	Brine
2003:				
Bulk	60.41	24.35	21.44	7.21
Compressed pellets	135.59	118.47	XX	XX
Packaged	142.17	71.44	73.00	XX
Average[2]	124.24	53.42	23.11	7.21
Pressed blocks	105.81	99.32	101.42	XX
2004:				
Bulk	62.36	23.33	24.22	7.01
Compressed pellets	138.26	114.85	XX	XX
Packaged	147.13	67.59	85.55	XX
Average[2]	128.39	49.25	25.83	7.01
Pressed blocks	105.30	93.53	103.57	XX

XX Not applicable.

[1]Net selling value, free on board plant, excluding container costs.

[2]Salt value data reported prior to 1984 were an aggregate value per metric ton of bulk, compressed pellets, and packaged salt. For time series continuity, an average of these three types of product forms is presented that is based on the aggregated values and quantities of the product form for each type of salt listed in table 3.

TABLE 8
U.S. EXPORTS OF SALT, BY COUNTRY[1]

(Thousand metric tons and thousand dollars)

Country	2003		2004	
	Quantity	Value[2]	Quantity	Value[2]
Argentina	3	169	1	91
Bahamas, The	1	231	1	213
Bahrain	1	276	1	322
Belgium	2	368	2	289
Canada	585	23,700	971	31,100
Chile	1	158	1	216
China	4	299	4	204
Colombia	(3)	100	1	250
Costa Rica	1	183	2	183
Dominican Republic	2	182	(3)	124
El Salvador	1	205	1	172
Germany	(3)	175	1	1,140
Honduras	8	874	14	1,640
Hong Kong	(3)	188	1	276
Israel	1	50	(3)	29
Italy	1	78	(3)	31
Japan	3	784	2	2,130
Korea, Republic of	1	144	1	190
Kuwait	1	165	(3)	93
Lebanon	(3)	153	2	226
Malaysia	3	135	4	271
Mexico	78	4,480	74	3,620
Netherlands	1	114	2	344
Norway	(3)	19	1	93
Panama	1	191	1	116
Philippines	(3)	46	4	394
Saudi Arabia	12	1,360	10	916
United Arab Emirates	1	380	3	609
United Kingdom	4	963	4	839
Other	4	1,280 r	4	1,480
Total	718	37,500	1,110	47,600

rRevised.

[1]Data are rounded to no more than three significant digits; may not add to totals shown. (The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.)

[2]Free alongside ship value at U.S. ports.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 9
U.S. EXPORTS OF SALT, BY CUSTOMS DISTRICT[1]

(Thousand metric tons and thousand dollars)

District	2003		2004	
	Quantity	Value[2]	Quantity	Value[2]
Anchorage, AK	2	96	3	156
Baltimore, MD	7	905	2	571
Boston, MA	8	265	--	--
Buffalo, NY	113	4,070	61	3,020
Charleston, SC	(3)	62	(3)	23
Chicago, IL	18	595	1	1,180
Cleveland, OH	157	3,820	423	9,950
Dallas-Fort Worth, TX	(3)	31	(3)	36
Detroit, MI	131	5,730	237	7,660
Duluth, MN	--	--	14	278
El Paso, TX	7	470	17	941
Great Falls, MT	9	494	5	668
Honolulu, HI	--	--	(3)	13
Houston, TX	11	2,140	19	3,170
Laredo, TX	64	3,430	50	2,200
Los Angeles, CA	8	1,060	14	2,180
Miami, FL	4	717	2	528
Mobile, AL	4	443	7	599
New Orleans, LA	3	411	1	135
New York, NY	10	1,530	16	1,680
Nogales, AZ	2	123	3	109
Norfolk, VA	1	212	1	193
Ogdensburg, NY	29	1,680	13	1,450
Pembina, ND	4	394	3	410
Philadelphia, PA	(3)	65	(3)	414
Portland, ME	1	60	--	--
St. Albans, VT	(3)	35	(3)	16
San Diego, CA	5	481	5	387
San Francisco, CA	5	579	23	763
Savannah, GA	(3)	52	(3)	77
Seattle, WA	11	712	21	1,140
Tampa, FL	(3)	75	1	216
Wilmington, NC	(3)	5	--	--
Other[4]	105	6,740	171	7,410
Total	718	37,500	1,110	47,600

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown. (The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.)

[2]Free alongside ship value at U.S. ports.

[3]Less than ½ unit.

[4]Unknown but assumed to be rail and/or truck shipments to Canada through various points of departure.

Source: U.S. Census Bureau.

TABLE 10
U.S. IMPORTS FOR CONSUMPTION OF SALT, BY COUNTRY[1]

(Thousand metric tons and thousand dollars)

Country	2003		2004	
	Quantity	Value[2]	Quantity	Value[2]
Australia	192	1,740	(3)	34
Bahamas, The	1,140	12,500	1,110	11,600
Belgium	1	110	11	131
Brazil	125	1,470	93	1,840
Canada	4,190	89,200	4,240	62,900
Chile	3,920	38,500	3,370	31,200
China	3	896	4	1,260
Colombia	1	131	5	234
Egypt	555	4,450	414	3,340
France	17	3,650	10	3,780
Germany	1	794	6	1,350
Iceland	1	130	--	--
India	33	314	38	438
Ireland	108	1,130	96	683
Israel	1	607	1	729
Italy	70	1,460	93	1,690
Japan	--	--	1	121
Jordan	8	517	--	--
Korea, Republic of	1	525	3	676
Mexico	1,190	18,000	1,120	15,000
Namibia	39	711	--	--
Netherlands	147	5,140	127	4,510
Netherlands Antilles	336	5,660	436	8,090
New Zealand	(3)	27	4	253
Pakistan	2	132	(3)	71
Panama	57	672	44	946
Peru	454	3,290	346	2,600
South Africa	3	164	3	197
Spain	7	440	1	585
Tunisia	34	863	--	--
United Kingdom	88	831	204	2,500
Venezuela	132	1,100	131	1,480
Other	1	335 [r]	1	627
Total	12,900	196,000	11,900	159,000

[r]Revised. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown. (The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.)

[2]Customs value only.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS OF SALT, BY CUSTOMS DISTRICT[1]

(Thousand metric tons and thousand dollars)

District	2003		2004	
	Quantity	Value[2]	Quantity	Value[2]
Anchorage, AK	20	502	2	252
Baltimore, MD	1,100	14,500	1,190	16,800
Boston, MA	1,250	12,100	986	11,100
Buffalo, NY	288	9,270	131	3,620
Charleston, SC	166	4,040	197	4,530
Chicago, IL	759	11,900	896	11,800
Cleveland, OH	473	9,350	386	5,030
Columbia-Snake, OR	2	149	(3)	5
Dallas-Fort Worth, TX	(3)	16	(3)	18
Detroit, MI	1,400	30,800	1,160	20,500
Duluth, MN	110	2,100	189	2,710
El Paso, TX	(3)	3	--	--
Great Falls, MT	3	314	1	61
Honolulu, HI	(3)	8	(3)	20
Houston-Galveston, TX	1	567	1	759
Laredo, TX	1	289	1	373
Los Angeles, CA	113	2,900	72	2,300
Miami, FL	(3)	131	(3)	194
Milwaukee, WI	841	18,600	931	8,380
Minneapolis, MN	(3)	12	(3)	26
Mobile, AL	--	--	(3)	48
New Orleans, LA	319	3,640	146	1,880
New York, NY	2,720	31,300	2,680	30,300
Nogales, AZ	--	--	(3)	61
Norfolk, VA	243	2,620	163	1,570
Ogdensburg, NY	154	3,670	172	3,260
Pembina, ND	1	481	2	291
Philadelphia, PA	876	9,630	951	10,200
Portland, ME	1,130	11,000	613	6,390
Providence, RI	510	8,160	506	5,860
St. Albans, VT	6	726	13	974
St. Louis, MO	(3)	21	3	234
San Diego, CA	(3)	38	1	163
San Francisco, CA	1	548	1	396
San Juan, PR	1	153	6	263
Savannah, GA	47	801	40	1,000
Seattle, WA	(3)	339	15	774
Tampa, FL	280	4,500	354	5,380
Wilmington, NC	36	441	99	1,410
Total	12,900	196,000	11,900	159,000

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown. (The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.)

[2]Customs value only.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12
SALT: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country[3]	2000	2001	2002	2003	2004[e]
Afghanistan, rock salt[e]	13	13	13	13	13
Albania	20 [r, e]	26 [r]	23 [r]	23 [r, e]	23
Algeria, brine and sea salt	182 [e]	185	205	191	183
Angola[e]	30	30	30	30	30
Argentina	1,000 [e]	1,270	1,080	1,156	1,200
Armenia	30	30 [e]	30 [r]	32 [r]	32
Australia, salt and marine salt	8,778	9,536	9,887	9,800 [e]	11,221 [4]
Austria:[e]					
Brine salt	400	400	400	400	400
Rock salt	1	1	1	1	1
Total	401	401	401	401	401
Azerbaijan	4	4 [e]	5 [r]	8 [r]	8
Bahamas, The[e]	900	900	900	900	900
Bangladesh, marine salt[e, 5]	350	350	350	350	350
Belarus[e]	311 [4]	300	300	300	300
Benin, marine salt[e]	-- [r]	-- [r]	-- [r]	-- [r]	--
Bolivia	1 [r]	(6)	4	2 [r]	2
Bosnia and Herzegovina[e]	50	50	50	50	50
Botswana[7]	185	179	315	229 [r]	208 [4]
Brazil:					
Brine salt	4,626	4,370	4,835	5,144 [r]	5,100
Rock salt	1,448	1,208	1,274	1,422 [r]	1,400
Total	6,074	5,578	6,109	6,566 [r]	6,500
Bulgaria	1,700 [e]	1,931	1,800 [e]	1,882 [r]	1,800
Burkina Faso[e]	5	5	5	5	5
Burma[e, 8]	35	35	35	35	35
Cambodia[e]	40	40	40	40	40
Canada	12,164	13,725	12,736 [r]	13,952 [r]	14,125 [4]
Cape Verde[e]	2	2	2	2	2
Chile	5,083	5,989	3,503	6,213 [r]	6,000
China	31,280	34,105	36,024	32,424	37,101 [4]
Colombia:					
Marine salt	282 [r]	384 [r]	336 [r]	248 [r]	320
Rock salt	178 [r]	184 [r]	192 [r]	199 [r]	220
Total	460	568 [r]	527 [r]	447 [r]	540
Costa Rica, marine salt[e]	37	37	37	37	37
Croatia	34	33	37	31 [r]	35
Cuba	177	180	180 [e]	180 [e]	185
Denmark, sales[e]	605	600	600	605	610
Djibouti	136	173	162	128 [r]	30
Dominican Republic:					
Marine salt[e]	50	50	50	50	50
Rock salt	163 [r]	190 [r]	157 [r]	107 [r]	107
Total	213 [r]	240 [r]	207 [r]	157 [r]	157
Ecuador[e]	90	90	90	90	90
Egypt[e]	2,400	2,400	2,400	2,400	2,400
El Salvador, marine salt	32 [r]	32 [r]	32 [r]	31 [r]	31
Eritirea, marine salt	47	78	116	52 [r]	53
Ethiopia, rock salt[e, 5]	56	61	61	61	61

See footnotes at end of table.

TABLE 12—Continued
SALT: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country[3]	2000	2001	2002	2003	2004[e]
France:[e]					
Brine salt	1,500	1,500	1,500	1,500	1,500
Marine salt	1,200	1,200	1,200	1,200	1,200
Rock salt	300	300	300	300	300
Salt in solution	4,000	4,000	4,000	4,000	4,000
Total	7,000	7,000	7,000	7,000	7,000
Georgia[e]	30	30	30	30	30
Germany:					
Marine salt	932 [r]	846 [r]	858 [r]	727 [r]	730
Rock salt and other	5 [r]	5 [r]	15 [r]	16 [r]	16
Total	937 [r]	851 [r]	873 [r]	743 [r]	746
Ghana[e]	150	68	99	250 [r]	250
Greece[e]	150	150	150	150	150
Guadeloupe[e]	49	49	49	49	49
Guatemala[e]	50	50	50	50 [r]	50
Guinea[e]	15	15	15	15	15
Honduras[e]	25	25	25	25 [r]	25
Iceland[e]	4	5	5	5	5
India:					
Marine salt[e]	14,450 [4]	14,500	14,500	15,000	15,000
Rock salt[e]	3	3	3	3	3
Total	14,453	14,503	14,503	15,003	15,000
Indonesia[e]	680	680	680	680	680
Iran[9]	1,560	1,985	1,970 [e]	1,970 [e]	2,000
Iraq[e]	300	300	203 [4]	50	50
Israel[e]	526 [4]	600 [r]	700 [r]	800 [r]	800
Italy:[e]					
Brine and rock salt	3,000	3,000	3,000	3,000	3,000
Marine salt, crude[10]	600	600	600	600	600
Total	3,600	3,600	3,600	3,600	3,600
Jamaica	19	19	19 [e]	19 [e]	19
Japan	1,374	1,358	1,282	1,273 [r]	1,251 [4]
Jordan	344 [r]	329 [r]	407 [r]	410 [r, e]	410
Kenya, crude salt	16	6	19	19 [e]	19
Korea, North[e]	500	500	500	500	500
Korea, Republic of[e]	800	800	800	800	800
Kuwait[e]	100	100	100	100	100
Laos, rock salt	2	3	5	16 [r]	15
Lebanon[e]	4	4	4	4	4
Libya[e]	40	40	40	40	40
Madagascar	26	26	17 [e]	23 [e]	23
Mali[e]	6	6	6	6	6
Malta, marine salt[e]	(6)	(6)	(6)	(6)	(6)
Martinique[e]	200	200	200	200	200
Mauritania[e]	6	6	6	6	6
Mauritius	6 [r]	7 [r]	7 [r]	7 [r, e]	7
Mexico	8,884	8,501 [r]	7,802 [r]	7,547 [r]	8,180 [4]
Mongolia, mine output	1	2	1	2 [r]	2
Morocco, marine and rock salt	188 [e]	234	266	236	240
Mozambique, marine salt[e]	7	10	80	80	80
Namibia, marine salt	523	543	630	698	700
Nepal[e, 11]	2 [4]	5	5	5	4
Netherlands[e]	5,000	5,000	5,000	5,000	5,000

See footnotes at end of table.

TABLE 12—Continued
SALT: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country[3]	2000	2001	2002	2003	2004[e]
Netherlands Antilles[e]	500	500	500	500	500
New Zealand[e]	60	70	70	70	70
Nicaragua, marine salt	16	18	30 [r]	31 [r]	31
Niger[e]	2	2	2	2	2
Oman	12	14	14	15 [e]	15
Pakistan:[e, 5]					
Marine salt	20	20	20	20	20
Rock salt	1,313 [4]	1,300	1,300	1,300	1,300
Total	1,333 [4]	1,320	1,320	1,320	1,320
Panama, marine salt[e]	23	23	23	23 [r]	23
Peru	248 [r]	419 [r]	279 [r]	187 [r]	249 [4]
Philippines, marine salt[e]	590 [4]	600	600	600	600
Poland:					
Rock salt	841	787	839	848 [r]	800
Recovered from brine	735	697	727	756 [r]	800
Total	1,576	1,484	1,566	1,604 [r]	1,600
Portugal, rock salt[e]	600	600	600	600	600
Romania:					
Rock salt	52	48	46 [e]	47 [r]	50
Other	2,215	2,176	2,211	2,368 [r]	2,400
Total	2,267	2,224	2,257	2,415 [r]	2,450
Russia[e]	3,200	2,800 [4]	2,800	2,800	2,800
Saudi Arabia	200	200	200 [e]	200 [e]	200
Senegal[e]	124 [r]	110 [r]	130 [e]	130 [e]	130
Serbia and Montenegro	78	62	42	65 [r]	65
Slovakia[e]	1,217 [r]	123 [r]	97 [r]	95 [r]	100
Slovenia[e]	99 [r]	108 [r]	128 [r]	125 [r]	125
Somalia[e]	1	1	1	1	1
South Africa	346	356	431	438	336 [4]
Spain:[e]					
Marine and other evaporated salt	1,200	1,200	1,200	1,200	1,200
Rock salt	2,000	2,000	2,000	2,000	2,000
Total	3,200	3,200	3,200	3,200	3,200
Sri Lanka	70	130	73 [r]	79 [r]	79
Sudan	87	78	83	84 [e]	84
Switzerland[e]	300	300	300	300	300
Syria	106	190 [r]	146 [r]	146 [e]	146
Taiwan, marine salt	70	66	57	(6)	-- [4]
Tanzania	70	65	71 [r]	59 [r]	60
Thailand:					
Rock salt	792	853	909	892 [r]	900
Other[e]	100	100	100	100	100
Total	892	953	1,009	992 [r]	1,000
Tunisia, marine salt	620	654	616	700 [e]	608 [4]
Turkey	2,126	1,771	2,197	2,243 [r]	2,250
Turkmenistan[e]	215	215	215	215	215
Uganda[e]	5	5	5	5	5
Ukraine[e]	2,287 [4]	2,300	2,300	2,300	2,300
United Kingdom:[e]					
Brine salt[12]	1,300	1,300	1,300	1,300	1,300
Rock salt	1,500	1,500	1,500	1,500	1,500
Other salt[12]	3,000	3,000	3,000	3,000	3,000
Total	5,800	5,800	5,800	5,800	5,800

See footnotes at end of table.

TABLE 12—Continued
SALT: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country[3]	2000	2001	2002	2003	2004[e]
United States, including Puerto Rico:					
United States:					
Brine	22,500	20,400	19,300	20,000	20,500 [4]
Rock salt	15,000	17,000	13,500	16,300	18,300 [4]
Solar salt	3,810	3,310	3,390	3,330	3,520 [4]
Vacuum and open pan	4,200	4,120	4,100	4,070	4,100 [4]
Puerto Rico[e]	45	45	45	45	45
Total	45,600	44,800	40,300	43,700	46,500 [4]
Venezuela[e]	350	350	350	350	350
Vietnam	590	669 [r]	1,089 [r]	1,275 [r]	1,300
Yemen[e]	95 [r]	95 [r]	125 [r]	116 [r]	120
Grand total	195,000 [r]	199,000 [r]	195,000 [r]	199,000 [r]	208,000

[e]Estimated. [r]Revised. -- Zero.

[1]World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through July 5, 2005.

[3]Salt is produced in many other countries, but quantities are relatively insignificant and reliable production data are not available. Some salt brine production data for manufacture of chlorine, caustic soda, and soda ash are not reported because of incomplete data reporting by many countries.

[4]Reported figure.

[5]Year ending June 30 of that stated.

[6]Less than ½ unit.

[7]From natural soda ash production.

[8]Brine salt produced, as reported by the Government of Burma in metric tons, was as follows: 2000—69,245; 2001—61,466 (revised); 2002—59,825 (revised); 2003—73,112 (revised); and 2004—58,000 (estimated).

[9]Year beginning March 21 of that stated.

[10]Does not include production from Sardinia and Sicily, which is estimated to be 200,000 metric tons per year.

[11]Year ending July 15 of that stated.

[12]Data captioned "Brine salt" for the United Kingdom are the quantities of salt obtained from the evaporation of brine; that captioned "Other salt" are for salt content of brines used for purposes other than production of salt.